

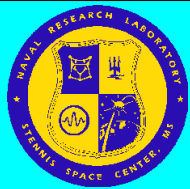
ESG Ocean Component

**Rick Allard, Daniel Fox, Jim Dykes, and Allison
Scogin**

**Naval Research Laboratory
Stennis Space Center, Mississippi**

15 September 2004

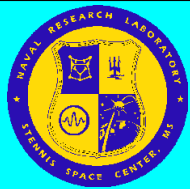
... as interpreted by Steve Lowe.



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Introduction

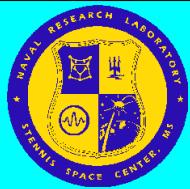
- Purpose
- Background on the Models
- WW3 hindcast simulations
- MODAS and NCOM products
- Processing and distribution of data
- Future Plans ?



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Purpose

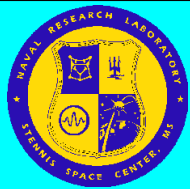
- Provide convenient access to a database of worldwide ocean coverage with parameters required by the Environmental Scenario Generator
- Time range with sufficient extent to provide any environmental scenario



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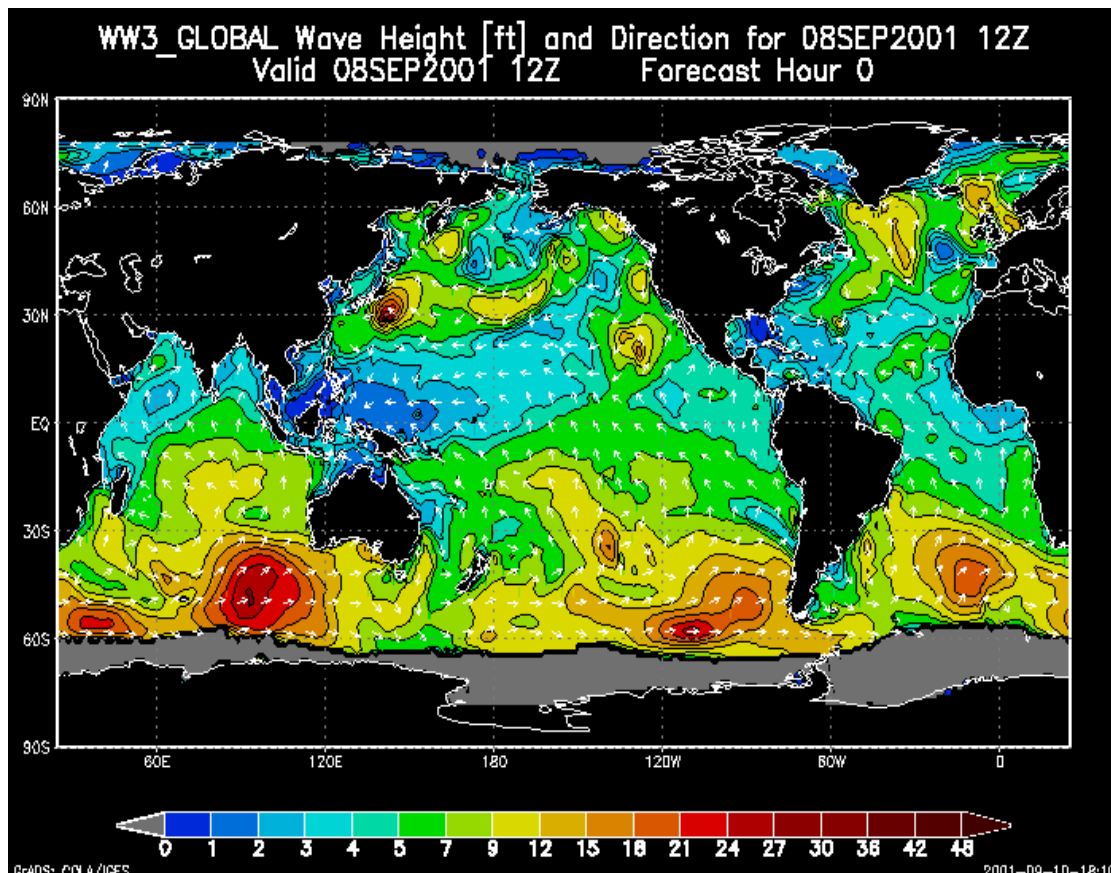
Background on WaveWatch 3

- Developed by H. L. Tolman, PhD
- Real-time Global and Regional runs at FNMOC and NCEP
- Forced by winds from global and regional meteorological models
- Parallelization: MPI or OpenMP

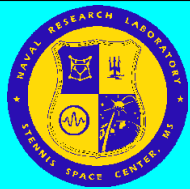


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WaveWatch 3 from FNMOC



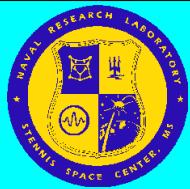
- Real-time every 12 hours
- Uses winds from NOGAPS and COAMPS
- Incorporates ice analysis



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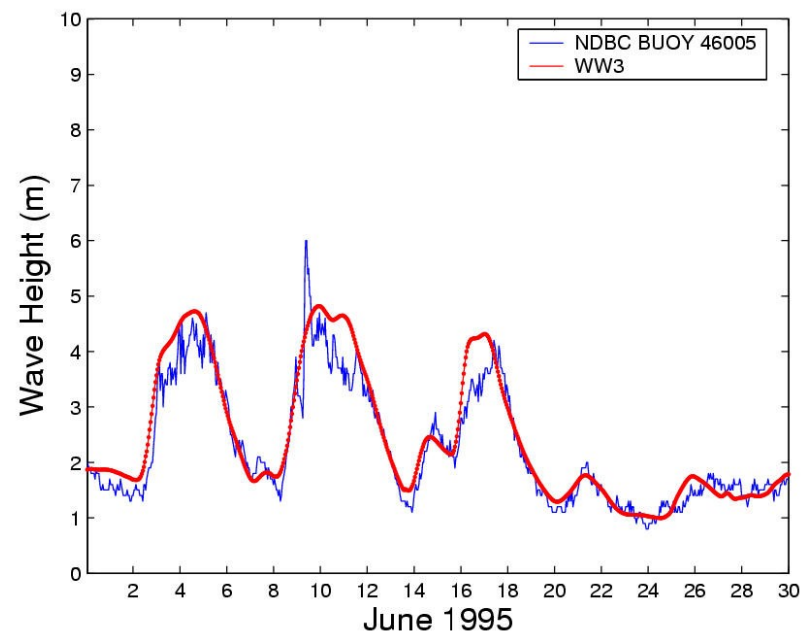
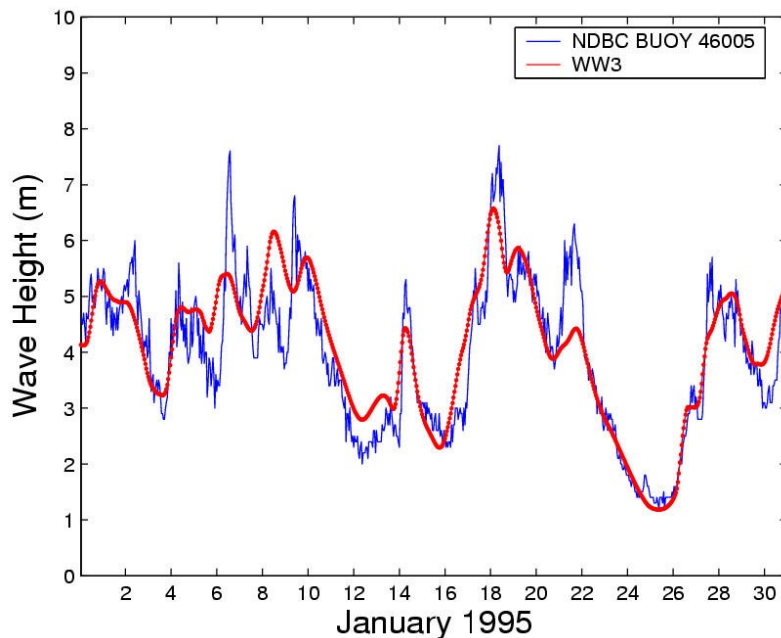
WW3 hindcast simulations

- Time covered: 1993 - 2002
- Operated on HPC IBM SP-4
- Input: wind U/V components, ice coverage from NCEP 2.5 Deg
 - Provided via ESG by SAIC
- Output: wave height, period, direction
 - 3-hr GRIB fields
 - Monthly Means
- Comparison: Model versus NDBC buoys

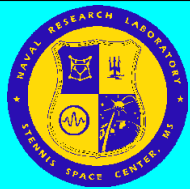


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WW3 Model versus NDBC Data

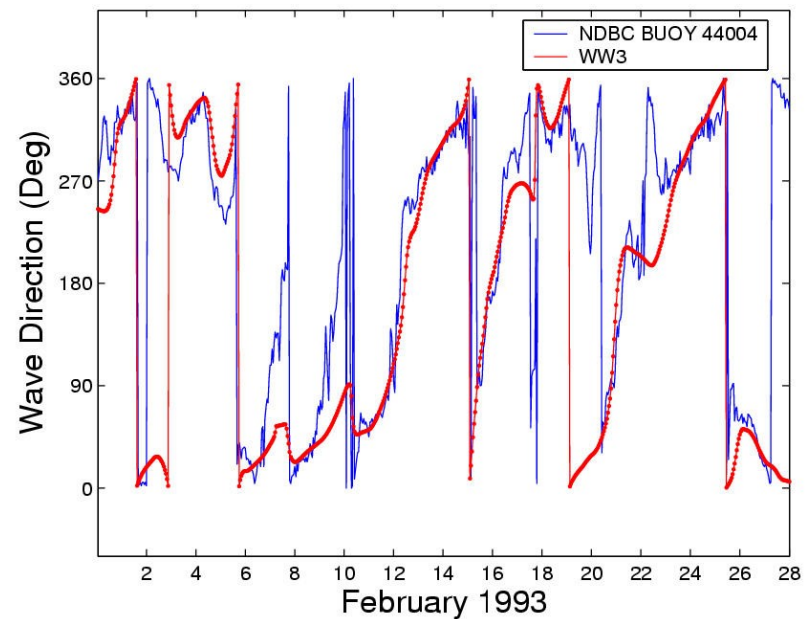
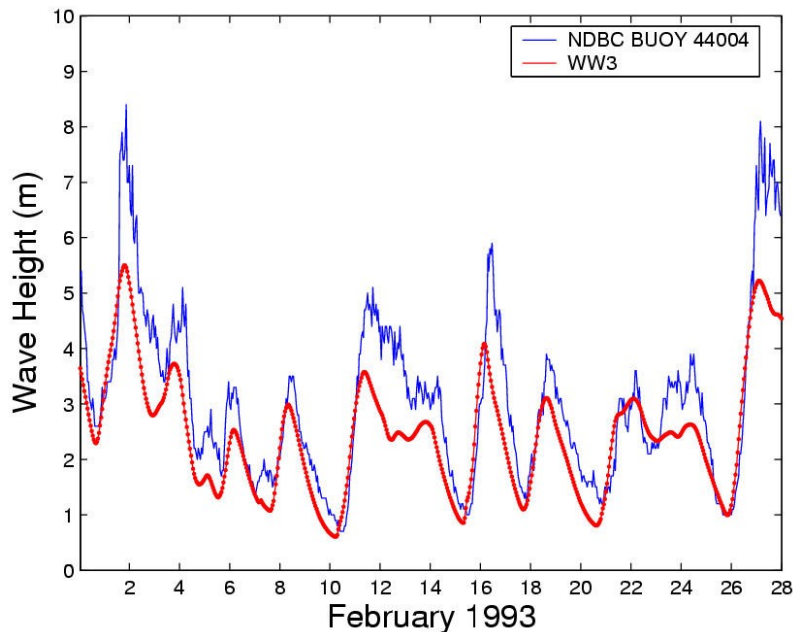


NDBC Buoy 46005 (46.05 °N, 131.02 °W)

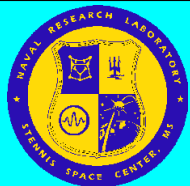


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WW3 Model versus NDBC Data

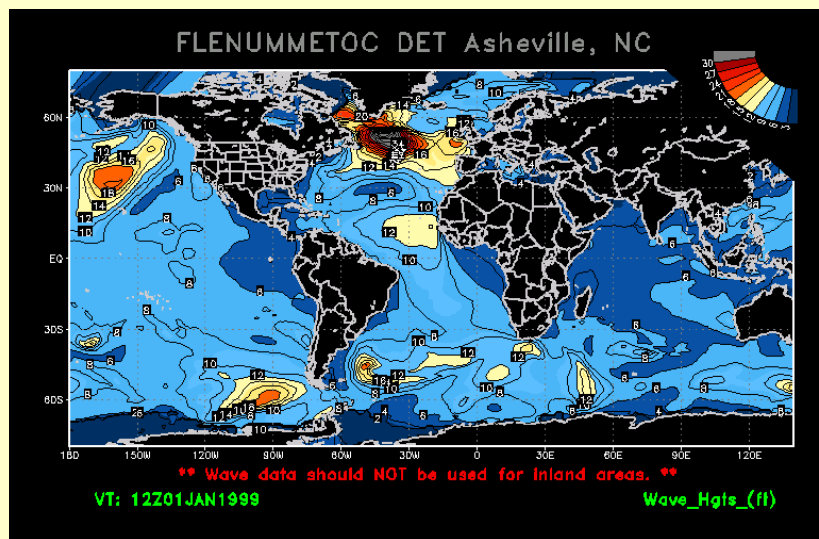


NDBC Buoy 44004 (38.47 °N, 70.56 °W)



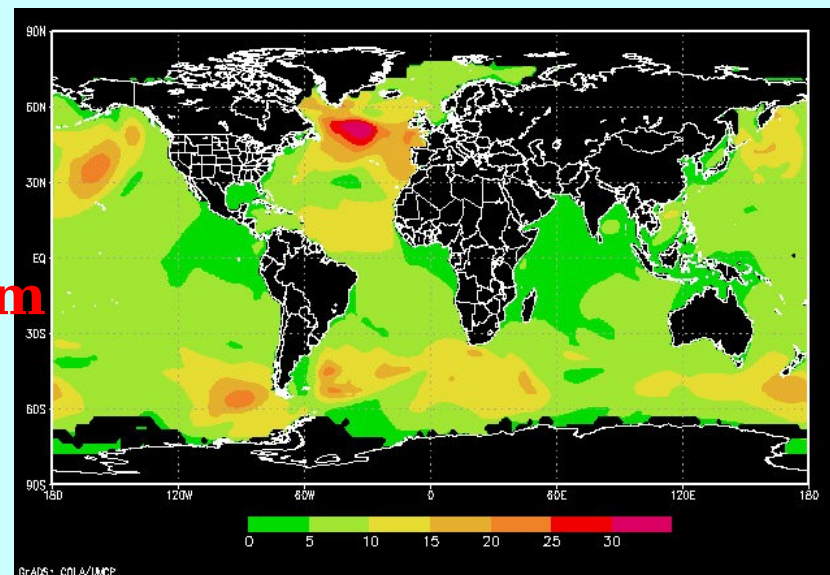
ESG Ocean Component

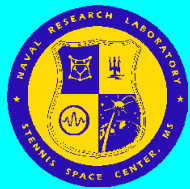
FNMOD Waves versus WW3



FNMOD graphic obtained from
<http://navy.ncdc.noaa.gov>

WW3 product generated with
ESG NCAR/NCEP 2.5° winds





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Background on MODAS

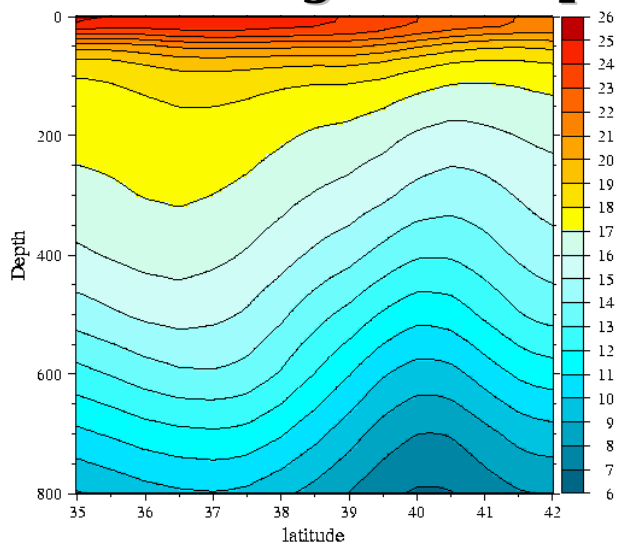
- First developed as modular architecture based on OTIS 2.1 (Carnes, et al. 1991)
- Real-time runs at NAVOCEANO for globe and regions in concert with POM/NCOM
- MODAS 2.0 developed for shallow water analysis and uses synthetics
- Runs at regional centers and on shipboard systems



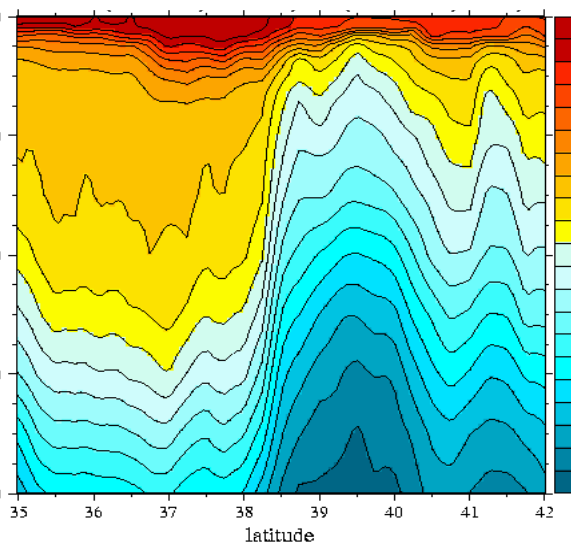
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Synthetic CTD Profiles from Satellite Measurement

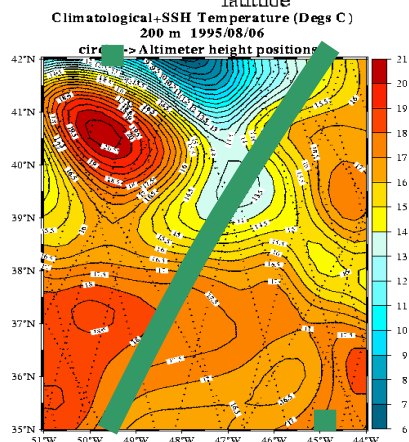
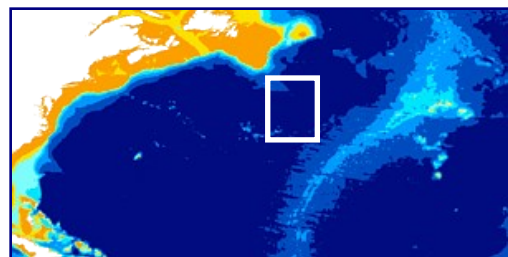
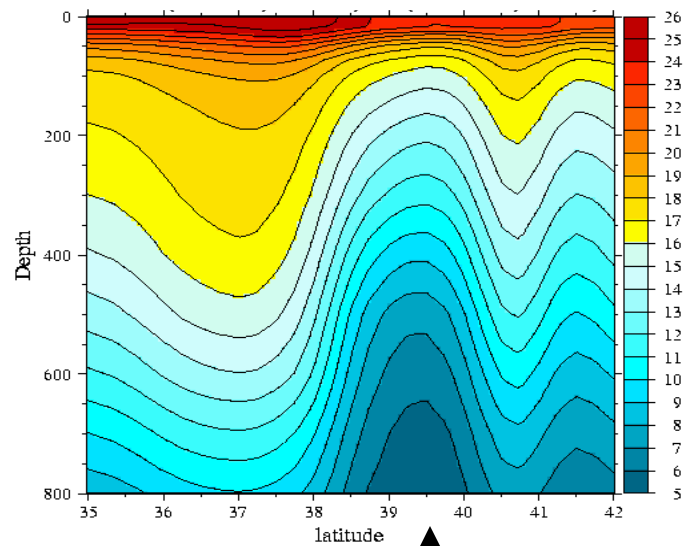
Climatological Temp



Actual AXBT Temp



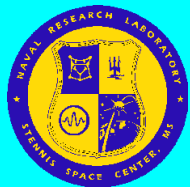
SSH + SST + Clim



MODAS Temperature at 200m

Satellite measurements and MODAS synthetic profile algorithms reveal ocean feature details.

This will now be used as a first guess field to blend in any local data.



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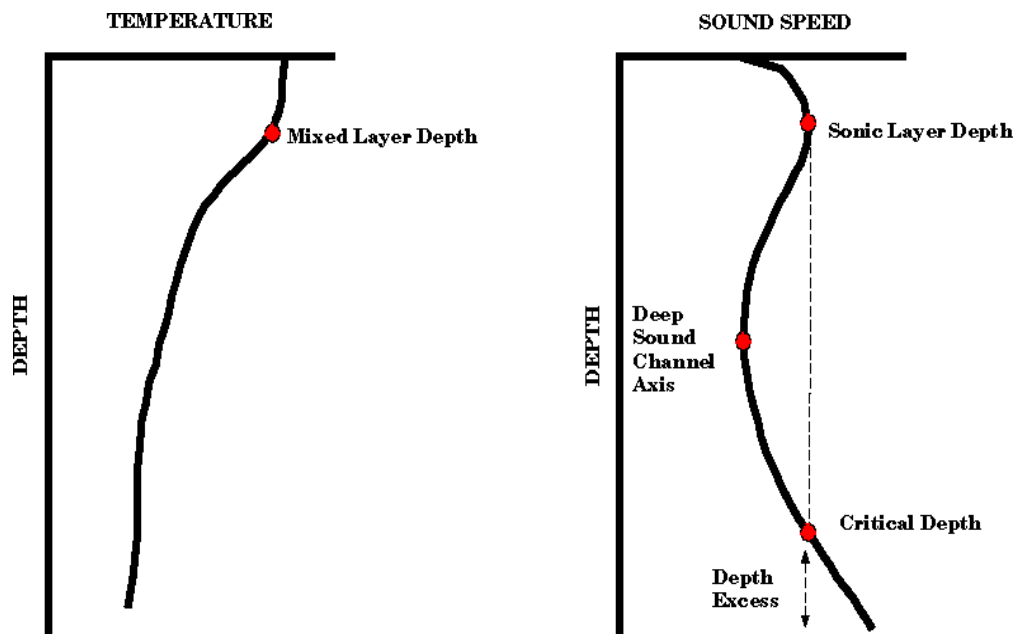
Available Fields from MODAS

3D fields

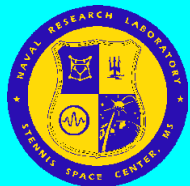
- Temperature
- Salinity
- Sound speed
- U and V currents

2D fields

- Surface T, S, svel, U, V
- Critical depth
- Deep, shallow and channel axes
- Sonic layer depth
- Depth excess
- Surface duct cutoff



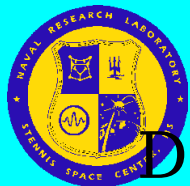
Note: 2D fields are stored in netCDF format. 3D fields are stored in a 'byte-encoded, compressed format' that was developed to transmit fields from NAVO to METOC Centers. Both compression and decompression are very fast but only 10:1 compression is achieved.



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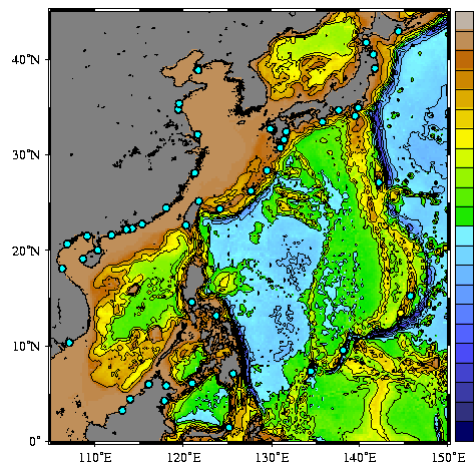
Background on NCOM

- First developed from POM
- Initialized/interacts with MODAS
- Transitioning to NAVOCEANO



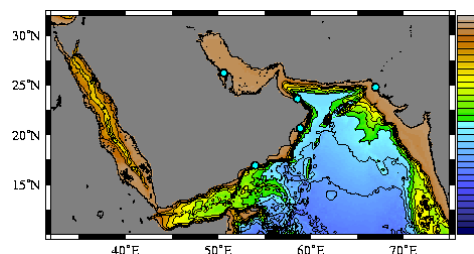
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Dates Presently Available from MODAS/NCOM



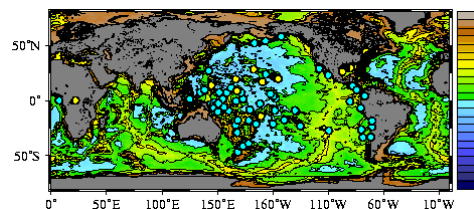
NEA area (Sea of Japan thru Phillipines, 1/8 deg resolution)

MODAS fields: 19930101 thru 20040201 (4049 daily fields)
NCOM fields: 20010401 thru 20030920 (903 daily fields)
Total disk space: 91 GB



SWA area (Persian Gulf, Arabian Sea, 1/8 deg resolution)

MODAS fields: 19930101 thru 20040201 (4049 daily fields)
NCOM fields: 20010401 thru 20030920 (903 daily fields)
Total disk space: 33 GB



WORLD (entire world, 1/4 degree resolution)

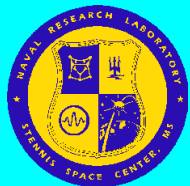
Note: weekly fields, not daily as in the two above areas

MODAS fields: 19930101 thru present (605 weekly fields)
NCOM fields: 19980101 thru present(*) (2300 daily fields)

* missing last 3 months of 2002;

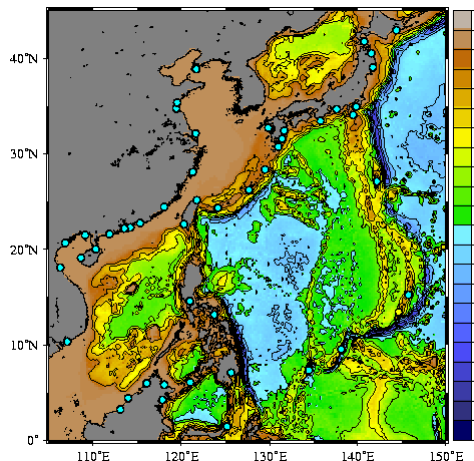
Total disk space: 410 GB

Grand Total: 534 GB



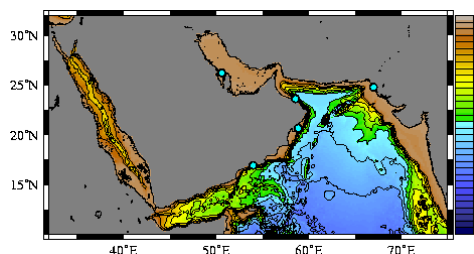
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Dates in Progress for MODAS/NCOM



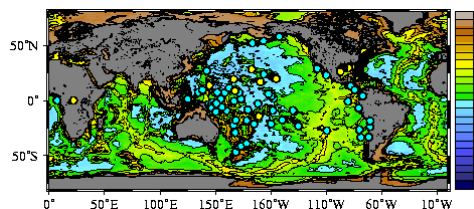
NEA area (Sea of Japan thru Phillipines, 1/8 deg resolution)

MODAS fields: 20040202 thru present (250 daily fields)
NCOM fields : 20030921 thru present (380 daily fields)
Total additional disk space: 31 GB
Final total size: 122 GB



SWA area (Persian Gulf, Arabian Sea, 1/8 deg resolution)

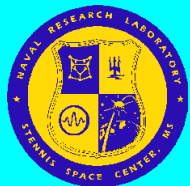
MODAS fields: 20040202 thru present (250 daily fields)
NCOM fields: 20030921 thru present (380 daily fields)
Total additional disk space: 13 GB
Final total size: 46 GB



WORLD (entire world, 1/4 degree resolution)

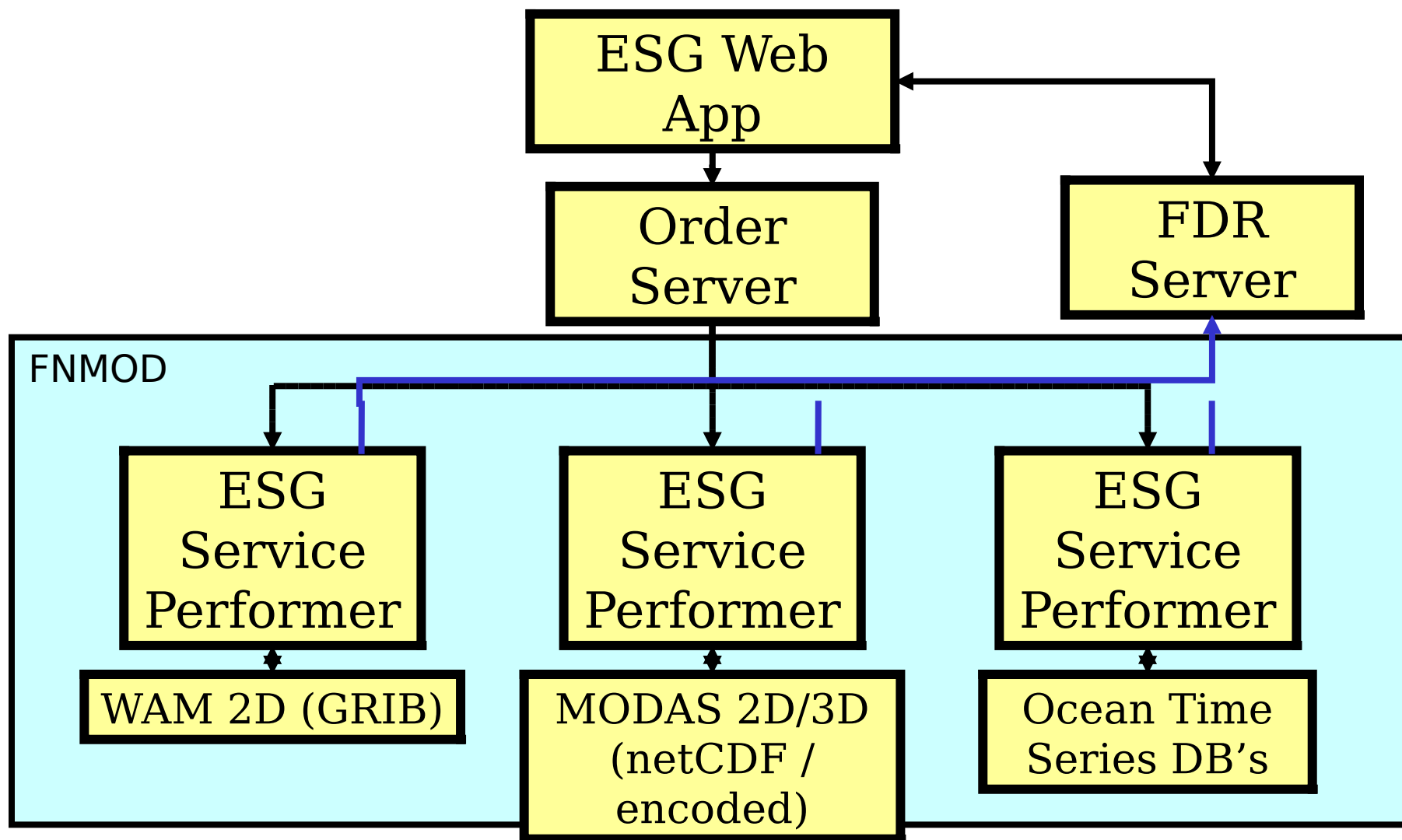
MODAS fields: 19930101 thru present
to fill in the gaps between the
Total additional disk space: 410 GB

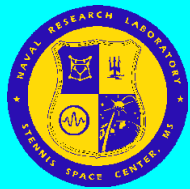
Grand Total: 1068 G



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Communications Infrastructure





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Future Plans

- Future Plans
 - Run selected regional areas at selected times
 - Use another model e.g. SWAN
 - Provide other kinds of statistics
 - Wavelet compression of MODAS
 - netCDF distribution in COARDS convention